Light action spectrum on oxidative stress and mitochondrial damage in A2E-loaded retinal pigment epithelium cells

Titre	Light action spectrum on oxidative stress and mitochondrial damage in A2E-loaded retinal pigment epithelium cells
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Mots-clés	A2E light stress oxidative stress retinal pigmentary epithelium [12]
Résumé en anglais	AIMS: Blue light is an identified risk factor for age-related macular degeneration (AMD). We investigated oxidative stress markers and mitochondrial changes in A2E-loaded retinal pigment epithelium cells under the blue-green part of the solar spectrum that reaches the retina to better understand the mechanisms underlying light-elicited toxicity. RESULTS: Primary retinal pigment epithelium cells were loaded with a retinal photosensitizer, AE2, to mimic aging. Using a custom-made illumination device that delivers 10 nm-wide light bands, we demonstrated that A2E-loaded RPE cells generated high levels of both hydrogen peroxide (HO) and superoxide anion (O) when exposed to blue-violet light. In addition, they exhibited perinuclear clustering of mitochondria with a decrease of both their mitochondrial membrane potential and their respiratory activities. The increase of oxidative stress resulted in increased levels of the oxidized form of glutathione and decreased superoxide dismutase (SOD) and catalase activities. Furthermore, mRNA expression levels of the main antioxidant enzymes (SOD2, catalase, and GPX1) also decreased. CONCLUSIONS: Using an innovative illumination device, we measured the precise action spectrum of the oxidative stress mechanisms on A2E-loaded retinal pigment epithelium cells. We defined 415-455 nm blue-violet light, within the solar spectrum reaching the retina, to be the spectral band that generates the highest amount of reactive oxygen species and produces the highest level of mitochondrial dysfunction, explaining its toxic effect. This study further highlights the need to filter these wavelengths from the eyes of AMD patients.
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